SESSION 9 – REGIONAL SEDIMENT MANAGEMENT II

CHAIR
Barry W. Holliday, U.S. Army Corps of Engineers

COORDINATOR
William McAnally, U.S. Army Corps of Engineers

TITLE OF PRESENTATIONS AND SPEAKERS
"Understanding Geologic Framework and Processes of Coastal Sedimentation Systems" by Jeff Haines, U.S. Geological Survey

"Candidate Eutrophication Models for TMDL Analyses in Support of the Clean Water Act" by Robert Carousel, Environmental Protection Agency

"Atchafalaya River and Mississippi River Gulf Outlet – Navigation Issues" by Tonja Koob, U.S. Army Corps of Engineers

"Maintaining Reliable Navigation Channels While Altering Alluvial Processes" by John Remus, U.S. Army Corps of Engineers

SUMMARY
Many water resource projects are designed and operated to remedy local sediment problems, sometimes at the expense of creating even larger problems some distance away. Successful project design and operation requires that sediment issues be resolved at both local and regional levels, yet resource managers lack the information and tools needed to make informed decisions. These challenges adversely affect navigation, flood and storm damage reduction efforts, and environmental quality in water resource projects. The U.S. MTS Task Force provided a national vision for MTS 2020, recommending R&D on overall effective sediment management which includes "holistic watershed and local/regional planning efforts." To meet this vision, a Regional Sediment Management Program is currently being developed to (a) provide knowledge and tools needed for holistic regional sediment management within USACE water resource projects to achieve economic and environmental sustainability, and (b) enable project planning, design, construction, operation, and maintenance that will minimize disruption of natural sediment pathways, or mediate natural processes that have adverse environmental or economic impacts.

Topics presented at this session included technical innovations and tools for better sediment management, and case histories of success stories in beneficial use. Speakers represented a diverse set of interests and organizations, including USACE and other federal agencies. The topics regarding the research and development and application of new technologies represent multi-agency efforts.

<u>Understanding Geologic Framework and Processes of Coastal Sedimentation Systems</u>
John Haines presented examples from USGS geologic mapping and research programs to provide a regional understanding of sediment distribution, transport, and evolution of coastal and nearshore systems. Results from both the Pacific and Atlantic coasts contribute to our understanding of the linkages between inner shelf, nearshore/coastal,

and river mouth deposits. He discussed developments in process understanding and modeling capabilities, as well as the implications of regional sedimentary systems on a variety of issues including shoreline erosion and habitat maintenance.

Candidate Eutrophication Models for TMDL Analyses in Support of the Clean Water Act

The Clean Water Act §303(d) requires the development of Total Maximum Daily Loads (TMDLs). The provisions provided in this act require each State to produce and provide the U.S. Environmental Protection Agency with a list of waters where water quality standards are not being attained, to prioritize the development of TMDLs for the water bodies that will result in attainment of standards, and to develop and implement the TMDLs. A TMDL is an estimate of the maximum pollutant loading from point and nonpoint sources that receiving waters can accept without exceeding water quality standards. A primary environmental focus for TMDLs is the use of models for characterization of sources of nutrients and sediments and their relative loadings from the river basins, and the role of nutrients/sediments from sub-basins on water quality in rivers, lakes, and estuaries for impacts such things as excessive algal blooms, low dissolved oxygen, and related fish kills. Nutrient TMDLs that warrant a detailed characterization and assessment of receiving water bodies in many instances require the use of an eutrophication model. A methodology is presented by which seven water quality models were identified as candidates for use in developing TMDLs for nutrients and sediment.

A case study was conducted to identify/evaluate receiving water quality models that provide a means to evaluate nutrient (i.e., nitrogen, phosphorus, or carbon) cycling by considering water-quality based variables and processes for Total Maximum Daily Load assessments. A large (80) number of water quality models were evaluated by searching and documenting the sources of information for science, criteria for model documentation, usage and technical support, software architecture, and nutrient (i.e., nitrogen, phosphorus, carbon) cycling. Based on a screening process developed in previous work, seven models satisfied the minimum requirements imposed by the pre-screening. This research presents the results of the first of two detailed model evaluations in the form of comparison matrices and explanatory text of the seven water quality models selected for use in TMDL assessments and potential linkage to watershed overland flow and transport models. Comparisons are made to hydrodynamic, sediment, water quality constituent capabilities, auxiliary model application tools and comparisons of usage, application and support. Model comparisons for each element used a two-tiered approach. First, *all* models have been compared head-to-head using general criteria. Afterwards more subtle differences between *similar* models (e.g., 3-D models) have been identified and documented using more specific criteria.

Future plans include a detailed model evaluation of eutrophication capabilities by comparing their differences from four systems including plants (phytoplankton,

periphyton, and macrophytes), the nitrogen cycle, the phosphorus cycle, the carbon cycle and dissolved oxygen balance.

Atchafalaya River and Mississippi River Gulf Outlet – Navigation Issues

The Mississippi River and two of its distributaries, the Atchafalaya River and the Mississippi River Gulf Outlet, are all major navigation channels through estuarine environments maintained by the New Orleans District of the Corps of Engineers. Each channel experiences riverine, estuarine, and coastal processes as it empties into the Gulf of Mexico. Despite their similarities, each channel has different sediment issues that directly impact navigational activities. At one extreme, the Atchafalaya River navigation channel courses through an actively building delta requiring frequent maintenance and advance maintenance dredging to keep it open to project depth. At the opposite extreme, the Mississippi River Gulf Outlet is experiencing tremendous wetland loss and habitat destruction primarily from the ship traffic traveling through that channel. The Mississippi River, geographically located between its two distributaries, experiences both land creation and land loss, depending on the time of year and local weather patterns. Because of the complex nature of sediment management along coastal Louisiana, new and innovative research approaches are needed for effective operation and maintenance of these estuarine navigation channels. Tonja Koob's presentation provided an overview of the navigation issues and addressed those gaps in current research and technology.

Maintaining Reliable Navigation Channels While Altering Alluvial Processes

The Missouri River from Sioux City, Iowa to the mouth, a distance of 734 miles, has been narrowed and straightened by the Corps of Engineers. The banks have been fixed in-place through a series of revetment and transverse dikes. Discharges upstream of Sioux City are controlled through a series of dams. Two of the results of this development have been the elimination of the natural depth diversity and the loss of the upstream sediment supply that has contributed toward incision at several locations along the Missouri River. The loss of depth diversity has benefited navigation, but has lead to the listing of a number a species as threatened or endangered. The channel incision negatively impacts the environment, but also hinders navigation as loading facilities become farther from the waters edge. John Remus's presentation provided an overview of the concepts implemented and/or proposed to date an assessment of the relative risk associated with each concept, and a listing of technology gaps.